

Department of Mathematical Sciences
KFUPM
Term 051

**MATH 101-06, 13 / Major Exam#3/ Time allowed=2 Hours
Code 001**

Name:

ID#:

1. [2 Marks]

The local linear approximation of $\tan(48^\circ)$ to 3 decimal places (take $\pi \approx 3.142$) is:

- a) 1.105 b) 1.115 c) 1.125 d) 1.135 e) 1.145 f) NP.

2 [2 Marks]

$$\sin^{-1}\left(\sin\left(\frac{31\pi}{7}\right)\right) = \text{a) } \frac{31\pi}{7} \quad \text{b) } \frac{-2\pi}{7} \quad \text{c) } \frac{2\pi}{7} \quad \text{d) } \frac{-3\pi}{7} \quad \text{e) } \frac{3\pi}{7} \quad \text{f) NP.}$$

3 [2 Marks]

An equation of the tangent line to the curve $\sin^{-1}(2x) - \cos^{-1}(2y) = 0$ at $(1/2\sqrt{2}, 1/2\sqrt{2})$ is:

- a) $y = x$ b) $y = 2x - 1/2\sqrt{2}$ c) $y = 3/2\sqrt{2} - 2x$ d) $y = \sqrt{2}/2 - x$ e) NP.

4 [2 Marks]

If $f(x) = \frac{2e^x+1}{3e^x-1}$, then $f^{-1}(x)$ is: a) $\frac{1}{3} \ln\left(\frac{2x+1}{3x-1}\right)$ b) $\ln\left(\frac{2x+1}{3x-1}\right)$ c) $\ln\left(\frac{x+1}{3x-2}\right)$ d) $\frac{1}{3} \ln\left(\frac{3x+2}{x-1}\right)$
e) $\ln\left(\frac{3x-1}{x+1}\right)$ f) NP.

5 [2 Marks]

$$\lim_{x \rightarrow 0^+} \frac{1}{(1 + \sin x)^{\frac{1}{\tan(2x)}}} = \text{a) } 0 \quad \text{b) } \sqrt{e} \quad \text{c) } e^2 \quad \text{d) } 1 \quad \text{e) } +\infty \quad \text{f) NP.}$$

6. [2 Marks]

$$\lim_{x \rightarrow 0} \frac{1}{2x} - \frac{1}{e^{2x} - 1} = \text{a) } -1/2 \quad \text{b) } 0 \quad \text{c) } 1/2 \quad \text{d) } -\infty \quad \text{e) } +\infty \quad \text{f) NP.}$$

7 [2 Marks]

The critical points of the function $f(x) = |x^2 + 2x - 1|$ are:

- a) $-1 \pm \sqrt{2}$ b) $0, -1 \pm \sqrt{2}$ c) -1 d) $-1, -1 \pm \sqrt{3}$ e) $-1, -1 \pm \sqrt{2}$ f) NP.

8. [2 Marks]

The function $f(x) = (x+1)^{2/7} - (x+1)^{8/5}$ has at $x = -1$

- a) a vertical tangent line b) a cusp c) a discontinuity d) an inflection point
e) an absolute minimum f) NP.

9 [2 Marks]

The function $f(x) = x^4 + 2x^3 - 12x^2 + x + 11$ is

- a) concave up on $(-\infty, -2)$ and concave down on $(-2, +\infty)$
b) concave up on $(-\infty, -2)$ and on $(1, +\infty)$ and concave down on $(-2, 1)$
c) concave down on $(-\infty, -2)$ and concave up on $(-2, +\infty)$
d) concave down on $(-\infty, -2)$ and on $(1, +\infty)$ and concave up on $(-2, 1)$
e) NP.

10 [2 Marks]

If a projectile is launched upward from ground level with an initial speed of $28m/s$, then the highest level reached by the projectile is

- a) 30 m b) 40 m c) 50 m d) 60 m e) 70 m f) NP.

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**MATH 101-06, 13 / Major Exam#3/ Time allowed=2 Hours
Code 002**

Name:

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1. [2 Marks]

The local linear approximation of $\tan(42^\circ)$ to 3 decimal places (take $\pi \approx 3.142$) is:

- a) 0.895 b) 0.885 c) 0.875 d) 0.865 e) 0.855 f) NP.

2 [2 Marks]

$$\sin^{-1}\left(\sin\left(\frac{22\pi}{5}\right)\right) = \text{ a) } \frac{22\pi}{5} \quad \text{ b) } \frac{-\pi}{5} \quad \text{ c) } \frac{\pi}{5} \quad \text{ d) } \frac{2\pi}{5} \quad \text{ e) } \frac{-2\pi}{5} \quad \text{ f) NP.}$$

3 [2 Marks]

An equation of the tangent line to the curve $\sin^{-1}(3x) - \cos^{-1}(3y) = 0$ at $(1/3\sqrt{2}, 1/3\sqrt{2})$ is:

- a) $y = x$ b) $y = 3x - 2/3\sqrt{2}$ c) $y = \sqrt{2}/3 - x$ d) $y = 4/3\sqrt{2} - 3x$ e) NP.

4 [2 Marks]

If $f(x) = \frac{2e^x - 1}{3e^x + 1}$, then $f^{-1}(x)$ is: a) $\frac{1}{2} \ln\left(\frac{x+1}{3x-2}\right)$ b) $\ln\left(\frac{1+x}{2-3x}\right)$ c) $\ln\left(\frac{x+1}{3x-2}\right)$ d) $\frac{1}{2} \ln\left(\frac{2-3x}{x+1}\right)$
e) $\ln\left(\frac{3x-2}{x+1}\right)$ f) NP.

5 [2 Marks]

$$\lim_{x \rightarrow 0^+} \frac{1}{(1 + \sin x)^{\frac{1}{\tan(3x)}}} = \text{ a) } 0 \quad \text{ b) } e^3 \quad \text{ c) } \sqrt[3]{e} \quad \text{ d) } 1 \quad \text{ e) } +\infty \quad \text{ f) NP.}$$

6. [2 Marks]

$$\lim_{x \rightarrow 0} \frac{1}{x} - \frac{3}{e^{3x} - 1} = \text{ a) } -3/2 \quad \text{ b) } 3/2 \quad \text{ c) } 0 \quad \text{ d) } -\infty \quad \text{ e) } +\infty \quad \text{ f) NP.}$$

7 [2 Marks]

The critical points of the function $f(x) = |x^2 + 2x - 2|$ are:

- a) $-1 \pm \sqrt{3}$ b) $0, -1 \pm \sqrt{3}$ c) -1 d) $-1, -1 \pm \sqrt{3}$ e) $-1, -1 \pm \sqrt{2}$ f) NP.

8. [2 Marks]

The function $f(x) = (x + 3)^{3/5} - (x + 3)^{8/3}$ has at $x = -3$

- a) a discontinuity b) a vertical tangent line c) an absolute minimum d) a cusp e) an inflection point f) NP.

9 [2 Marks]

The function $f(x) = x^4 - 4x^3 - 18x^2 + 37x + 19$ is

- a) concave up on $(-\infty, -1)$ and concave down on $(-1, +\infty)$
b) concave down on $(-\infty, -1)$ and concave up on $(-1, +\infty)$
c) concave down on $(-\infty, -1)$ and on $(3, +\infty)$ and concave up on $(-1, 3)$
d) concave up on $(-\infty, -1)$ and on $(3, +\infty)$ and concave down on $(-1, 3)$
e) NP.

10 [2 Marks]

If a projectile is launched upward from ground level with an initial speed of $42m/s$, then the highest level reached by the projectile is

- a) 70 m b) 80 m c) 90 m d) 100 m e) 110 m f) NP.

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**MATH 101-06, 13 / Major Exam#3/ Time allowed=2 Hours
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1. [2 Marks]

The local linear approximation of $\cot(48^\circ)$ to 3 decimal places (take $\pi \approx 3.142$) is:

- a) 0.875 b) 0.885 c) 0.895 d) 0.865 e) 0.855 f) NP.

2 [2 Marks]

$$\cos^{-1}\left(\cos\left(\frac{33\pi}{8}\right)\right) = \text{a) } \frac{33\pi}{8} \quad \text{b) } \frac{3\pi}{8} \quad \text{c) } \frac{\pi}{8} \quad \text{d) } \frac{5\pi}{8} \quad \text{e) } \frac{\pi}{4} \quad \text{f) NP.}$$

3 [2 Marks]

An equation of the tangent line to the curve $\sin^{-1}(4x) - \cos^{-1}(4y) = 0$ at $(1/4\sqrt{2}, 1/4\sqrt{2})$ is:

- a) $y = \sqrt{2}/4 - x$ b) $y = 4x - 3/4\sqrt{2}$ c) $y = 5/4\sqrt{2} - 4x$ d) $y = x$ e) NP.

4 [2 Marks]

If $f(x) = \frac{e^x+4}{e^{x-5}}$, then $f^{-1}(x)$ is: a) $\frac{1}{4} \ln\left(\frac{x-4}{x+5}\right)$ b) $\ln\left(\frac{5x+4}{x-1}\right)$ c) $\ln\left(\frac{x-1}{5x+4}\right)$ d) $\frac{1}{5} \ln\left(\frac{x-1}{5x+4}\right)$
e) $\ln\left(\frac{3x-1}{x+1}\right)$ f) NP.

5 [2 Marks]

$$\lim_{x \rightarrow 0^+} (1 + \sin x)^{\frac{1}{\tan(4x)}} = \text{a) } 0 \quad \text{b) } +\infty \quad \text{c) } e^4 \quad \text{d) } 1 \quad \text{e) } \sqrt[4]{e} \quad \text{f) NP.}$$

6. [2 Marks]

$$\lim_{x \rightarrow 0} \frac{-1}{2x} - \frac{1}{e^{-2x} - 1} = \text{a) } -1/2 \quad \text{b) } 0 \quad \text{c) } 1/2 \quad \text{d) } -\infty \quad \text{e) } +\infty \quad \text{f) NP.}$$

7 [2 Marks]

The critical points of the function $f(x) = |x^2 - 2x - 1|$ are:

- a) 1, $1 \pm \sqrt{2}$ b) 0, $1 \pm \sqrt{2}$ c) 1 d) 1, $1 \pm \sqrt{3}$ e) $1 \pm \sqrt{2}$ f) NP.

8. [2 Marks]

The function $f(x) = (x+1)^{2/7} - (x+1)^{8/5}$ has at $x = -1$

- a) a vertical tangent line b) a cusp c) a discontinuity d) an inflection point
e) an absolute minimum f) NP.

9 [2 Marks]

The function $f(x) = x^4 + 2x^3 - 12x^2 + x + 11$ is

- a) concave up on $(-\infty, -2)$ and concave down on $(-2, +\infty)$
b) concave up on $(-\infty, -2)$ and on $(1, +\infty)$ and concave down on $(-2, 1)$
c) concave down on $(-\infty, -2)$ and concave up on $(-2, +\infty)$
d) concave down on $(-\infty, -2)$ and on $(1, +\infty)$ and concave up on $(-2, 1)$
e) NP.

10 [2 Marks]

If a projectile is launched upward from ground level with an initial speed of 56m/s , then the highest level reached by the projectile is

- a) 130 m b) 140 m c) 150 m d) 160 m e) 170 m f) NP.

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1. [2 Marks]

The local linear approximation of $\cot(42^\circ)$ to 3 decimal places (take $\pi \approx 3.142$) is:

- a) 1.145 b) 1.135 c) 1.125 d) 1.115 e) 1.105 f) NP.

2 [2 Marks]

$$\cos^{-1}\left(\cos\left(\frac{40\pi}{9}\right)\right) = \text{a) } \frac{40\pi}{9} \quad \text{b) } \frac{2\pi}{9} \quad \text{c) } \frac{4\pi}{9} \quad \text{d) } \frac{5\pi}{9} \quad \text{e) } \frac{7\pi}{9} \quad \text{f) NP.}$$

3 [2 Marks]

An equation of the tangent line to the curve $\sin^{-1}(5x) - \cos^{-1}(5y) = 0$ at $(1/5\sqrt{2}, 1/5\sqrt{2})$ is:

- a) $y = x$ b) $y = \sqrt{2}/5 - x$ c) $y = 6/5\sqrt{2} - 5x$ d) $y = 5x - 4/5\sqrt{2}$ e) NP.

4 [2 Marks]

If $f(x) = \frac{e^x+5}{e^{x-6}}$, then $f^{-1}(x)$ is: a) $\ln(\frac{6x+5}{x-1})$ b) $\ln(\frac{x-1}{6x+5})$ c) $\ln(\frac{x+5}{x-6})$ d) $\frac{1}{6}\ln(\frac{x+5}{x-6})$
e) $\ln(\frac{x-5}{x+6})$ f) NP.

5 [2 Marks]

$$\lim_{x \rightarrow 0^+} (1 + \sin x)^{\frac{1}{\tan(5x)}} = \text{a) } \sqrt[5]{e} \quad \text{b) } 0 \quad \text{c) } e^5 \quad \text{d) } 1 \quad \text{e) } +\infty \quad \text{f) NP.}$$

6. [2 Marks]

$$\lim_{x \rightarrow 0} \frac{-1}{x} - \frac{3}{e^{-3x} - 1} = \text{a) } -3/2 \quad \text{b) } 0 \quad \text{c) } 3/2 \quad \text{d) } -\infty \quad \text{e) } +\infty \quad \text{f) NP.}$$

7 [2 Marks]

The critical points of the function $f(x) = |x^2 - 2x - 2|$ are:

- a) $1 \pm \sqrt{3}$ b) 0, $1 \pm \sqrt{3}$ c) 1, $1 \pm \sqrt{3}$ d) 1, $1 \pm \sqrt{2}$ e) 1 f) NP.

8. [2 Marks]

The function $f(x) = (x-3)^{7/11} - (x-3)^{11/7}$ has at $x = 3$

- a) a vertical tangent line b) a cusp c) a discontinuity d) an inflection point
e) an absolute minimum f) NP.

9 [2 Marks]

The function $f(x) = x^4 + 4x^3 - 18x^2 + 41x + 23$ is

- a) concave up on $(-\infty, -3)$ and on $(1, +\infty)$ and concave down on $(-3, 1)$
b) concave down on $(-\infty, -3)$ and on $(1, +\infty)$ and concave up on $(-3, 1)$
c) concave down on $(-\infty, -3)$ and concave up on $(-3, +\infty)$
d) concave up on $(-\infty, -3)$ and concave down on $(-3, +\infty)$
e) NP.

10 [2 Marks]

If a projectile is launched upward from ground level with an initial speed of $70m/s$, then the highest level reached by the projectile is

- a) 250 m b) 260 m c) 270 m d) 280 m e) 290 m f) NP.